［様式－学 5］

Abstract of Doctoral Thesis

Title：Research on Hybrid Loop-Free Routing Protocol in Cognitive Mesh Networks

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A cognitive mesh network is a wireless mesh network which is applied cognitive techniques. A purpose of the cognitive mesh network is to supply wide area and high quality access environment to backbone networks by cooperation of terminals with plural wireless interfaces. Existing researches does not assume the parallel usage of multiple interfaces, but assume the selective usage of them. When the interfaces are used selectively, each terminal is connected via only a link. Thus, there is little difference from wireless mesh networks and wireless multi-hop networks. Other researches, assuming the parallel usage of multiple interfaces, do not need any routing protocols, because they presume one-hop communications.

In this way, researchers have not paid attention to routing protocols considering the parallel usage of multiple interfaces, and to how to handle multiple interfaces. Thus, this research has been investigating a routing protocol and a packet distribution method for cognitive mesh networks.

A routing loop is one of issues to be settled for routing protocols. A routing loop on wired networks makes congestion on routers which consist in the routing loos. Finally, packets which go through the routers are lost by queue overflow. Influence of routing loops in wireless multi-hop networks is more serious than in wired networks. Routing loops of wireless communication influence not only on terminals on the loops, but also on terminals and flows that are adjacent to the loops. The total number of links is in proportion to the number of interfaces. Thus, routing management of cognitive mesh networks will become complicated. In addition, frequency and influence of routing loops will become worse.

Existing techniques, to collects multiple interfaces to one virtual interface, assumes communication speed of each interface is the same. Thus, the techniques distributes packets among interfaces equally. In addition, they assume that the routes are also the same, whichever interface transmits packets. In cognitive mesh networks, communication speed and communication range of each interface is assumed to be different. These differences means that one flow will use plural routes. Therefore, existing techniques are not suitable for cognitive mesh networks. Fluid change of

wireless link quality changes fluidly. Thus, communication performance and link quality are considered to use multiple interfaces effectively. In this paper, the methods related to route control and interface control are proposed:

- Hybrid proactive and reactive routing protocol and hybrid static and dynamic metric.
- Adaptive packet distribution control based on link cost model and a stabilization method of communication load by suppression of route change frequency.

In addition, the effective of the proposed methods are confirmed by simulation evaluation and discussed in this paper.